Worksheet to Identify Potential Indicators for Ecological Monitoring

You return to visit your park in 20 years and walk through the park with the current resource manager. The manager tells you about the current condition of the natural resources, the management issues, and threats of the day. What would that person describe to you?

Water quality as it affects the cave and as it affects surface water. Development outside the park. Small ranchettes with wells and septics. Air quality, especially in regards to energy development. CWD and general wildlife diseases. Carrying capacity in terms of visitors (surface and cave) and in terms of range and ecology. Species richness and diversity. Vegetation at a community level (forest, grassland).

What are the park's most significant natural resources (e.g., the river and its tributaries, caves and cave fauna, rare plant communities, elk herd)?

Cave. Grassland. Bison, elk, and pronghorn mentioned in enabling legislation. Prairie dogs and four plant species of concern. Ferrets. Hardwood communities. Water for animals, park use, affects on vegetation. Class I airshed and viewshed. Significant paleontological resources.

What does your park contribute to regional biological diversity (e.g., what natural resources are preserved and protected at your park that are altered or threatened throughout the rest of the region)?

Bison herds. Large prairie dog complex. Mosaic of burned areas with a diversity of species composition, structure, and function. Unlogged forest. Mature bull elk and herd demographics. Park is an exemplary site for vegetation according to TNC report. Snag community. One of only air quality monitoring stations.

What park-specific legislative mandates direct the park to monitor a particular natural resource at your park.

Air quality. May be implicit language to monitor large mammals. An agreement with State to jointly monitor and conduct surveillance of elk and deer. May be committed to some monitoring of plan. Burn plans and associated NEPA documents require monitoring to see if burn met objectives.

What federal and state-listed threatened and endangered species are known to occur in the park?

Prairie dog is a candidate. Bald eagle occurs occasionally, especially during the winter. Mountain lion may be state-listed. Swift fox is state listed. Four state species of concern. One land snail and several birds and bats that are state listed species of concern.

What is that status of your park's management plans?

RMP in development. Bison plan in development. Ferret plan. Prairie dog plan in development. Fire Management Plan being update. Cave Management Plan being updated. Vegetation plan in development. GMP completed in 1994. Statement for Management Plan in 1994. Elk Management Plan being developed.

What is currently being monitored at or near the park by NPS or other entities (e.g., plants by fire effects program, plants by LTEM, exotic plants by exotic plant teams, birds by Breeding Bird Survey, butterflies, stream by USGS, Christmas bird count, weather data, NRCS photography, visitors by park staff, state roadside counts --- use the checklist below)?

Air: *Yes. IMPROVE, CASTNET, NADP, and Ozone.*

Amphibian: *Informal monitoring of salamanders. And general observations.*

Birds: *Christmas bird count by park staff. Saw-whet and flammulated owls by park staff. BBS since about 97. Field transects. Survey for raptor nests. Sharp-tailed grouse leks (may not be complete all years).*

Fire: *Fire Effects.*

Fish: *Several fish inventories and surveys, but no long-term monitoring.*

Geology: *Air flow monitoring in cave may provide information on cave geology, but more a research project. Paleontological resources will need to be monitored.*

Mammals: *Prairie dog area using GPS and walking. Bison roundups (genetics). Elk aerial surveys sometimes in cooperation with state. Ground surveys for elk, primarily for CWD – will continue for next 4 years – not systematic. Field surveys for pronghorn in late summer/fall – still some animals with collars. Have deer telemetry study. Started looking at two caves for bat use – looking at roosting and movement in and out.*

Meteorology: *Yes, as part of air quality. Putting in today a total weather station (part of CastNet).*

Pests: *Gypsy moths (get traps from Forest Service and park puts them out).*

Pesticides *No.*

Reptiles: *No.*

Soils: *No. But have had existing soil maps revised by Rocky Ford and looked at mineral licks.*

Sound: *No.*

Vegetation: *EPMT mapping and park crew. Fire Effects monitoring. Range assessment using NRCS methods – started in 2003 and will probably become permanent. Established plots using Dan Uresk's scorecard for woody vegetation, looking at seral stage. Have exclosures and have "scorecard" plots in some of them (have 5 for protection of native hardwoods, and others put in as part of ungulate study – study is over but study could be replicated). Informal survey for state plant species of concern.*

Visitors *Overnight visitors get permits at trailhead. Day use of horses needs permitted. Cave use – includes tours and permits for special uses. Traffic counters on the highway. Campground use. Law enforcement records including rocks.*

Visual Landscape: *No current monitoring although Ed Delaney established points, primarily in regards to Casey property (entire boundary expansion). One time effort called Integral Vista study.*

Water Quality: *Monthly water quality parameters at perennial streams (park does it inhouse – Beaver, Highland, Cold Spring). USGS gauging station on Beaver Creek managed by USGS. Water level in cave monitored monthly. Wells monitored for drinking water. Parking lot project will result in associated water quality monitoring.*

Wildlife or Plant Disease: *Bison for TB when shipped to states required, brucellosis for all. CWD for animals exhibiting signs plus tonsillar biopsy study. Study for coyotes but not longterm, although park would like it to be. Observations for plague.*

What are the stressors on park resources? What are the sources of each stressor?

Diseases such plague, West Nile, CWD, and others. Exotic plants. Air quality impacts from energy development out west as well as other sources. Water quality depletion. Large ungulates overabundance or unnatural levels can be a stressor. Unnatural fire patterns is a stressor. Surface development affects on cave. Use of cave by visitors, park staff, etc. (lack of carrying capacity information). Infrastructure in the cave (e.g., lights) Development and land use adjacent to the park. Exotic wildlife including brook trout, occasional feral cat. Small size of park and isolation. Visitor stress to wildlife such as on roads.

What potential management actions in the future may require monitoring (e.g., potential species reintroductions, land acquisitions, commercial uses)?

Casey property acquisition. Ferret reintroduction. Use of herbicides.

What would your partners like you to monitor?

State would like park to monitor for CWD and elk demographics. FWS wants monitoring of prairie dogs for candidate assessment. Forest Service would like monitoring of birds using the protocol used on the Forest. County wants control of exotic plants. Comments on boundary expansion address fish (generally in regards producing fish).

What current research is occurring at the park (research differs from monitoring in that it is typically of shorter duration, say 2-3 years)?

Vital signs are: 1) sensitive enough to provide early warning of change, 2) have low natural variability, 3) can be accurately and precisely measured, 4) have costs and effort of measurement that are not prohibitive, 5) have monitoring results that can be interpreted and explained, 6) are low impact to measure, and 7) have measurable results that can be replicated with various personnel. Off the top of your head, look into your crystal ball and choose several vital signs to monitor over time to track the condition of natural resources within your park (items can range from broad, e.g., the stream, to narrow, e.g., a particular species). What are those vital signs? Rank them in order of importance.

Air quality (currently being monitored)
Vegetation community monitoring
Forage production and biomass
Browse
Cave biota at Wind Cave
Algae at Wind Cave
Non-biotic monitoring of caves (park doing some but could be enhanced)
Large ungulate populations
Herd health
Adjacent land practices
Water quality (macro-invertebrates) in streams and springs and caves
Water quantity
Dust in the cave
Songbirds
Bat use of caves (excluding Wind Cave)

Impact of air quality on vegetation
Raptors
Butterflies
Diseases of mid-size carnivores
Fish census
Climatological data (park has one station)
Small mammals